

STORMS AND WARNINGS—WEATHER AND CROPS.

STORMS AND WEATHER WARNINGS.

Washington Forecast District.—The month was unusually quiet with long periods of fair weather and gentle to moderate winds. Previous to the 27th the only storm warnings issued were for the middle Atlantic coast at and between Hatteras and Cape Henry on the 9th, when a moderate disturbance was central some distance off the coast, and for the extreme southern Florida coast on the afternoon of the 18th, at which time a disturbance was apparently central immediately north of Cuba. However, this disturbance moved westward and lost intensity, after causing strong northeast winds in the Florida Straits. On the 27th a storm of marked intensity was over the region of the Great Lakes, moving east-northeast, and southwest storm warnings were ordered on the Atlantic coast at and north of Hatteras and on Lakes Erie and Ontario and northwest warnings on Lake Huron and eastern Lake Michigan. This storm increased in intensity during the 27th, causing gales on the lower Lakes, but decreasing in intensity during the following night as it moved to the lower St. Lawrence valley. The only strong wind reported on the Atlantic coast was 48 miles an hour from the south at New York, N. Y. A disturbance of wide extent was over the Plateau and southern Rocky Mountain regions on the morning of the 31st, with rapidly falling pressure over the southern Plains States. Noon special observations indicated that the storm would move rapidly northeastward over the upper Mississippi Valley and upper Lake region with increasing intensity. Accordingly, northeast storm warnings were ordered displayed at 6 p. m. on Lake Superior, northern Lake Michigan, and northern Lake Huron. These warnings were verified.

Frost warnings were issued for portions of the Lake region, the Ohio Valley, the Appalachian Mountain region, and the north Atlantic States on the 1st, 2d, 5th, 6th, and 7th, and they were well verified, as a rule, except in the lower Lake region, where the weather continued cloudy. There was a prolonged period of mild temperature after the 7th, and no further frost warnings were issued until near the close of the month. On the 28th warnings were issued for the region of the Great Lakes, the Ohio Valley, Tennessee, and the interior of Mississippi and Alabama; on the 29th for almost the entire district as far south as extreme northern Florida; and on the 30th for the Appalachian Mountain region and the Atlantic States north of Florida, except northern New England. All of these warnings were fully verified, except in New England and New York on the 29th.

The following special forecast was made on the morning of the 23d for the benefit of the contestants in the international balloon race which started from Birmingham, Ala., during the afternoon of that date:

The outlook is for unsettled, showery weather to-night, Sunday, and probably Monday from Alabama northward over Tennessee, the Ohio Valley and the Lake region. Winds will be gentle easterly at the surface in Alabama and Tennessee this afternoon and to-night and southeast about 6 meters per second at elevation of 1,000 to 2,000 meters. Balloons will drift northwestward over western Tennessee, then northward over Kentucky, and probably northeastward from the Ohio Valley to the lower Lake region, but conditions not certain at this time.

—Charles L. Mitchell.

Chicago Forecast District.—Frosts were reported on the 1st from the Missouri Valley eastward to the limits of the region, these having been forecast the day before. Additional warnings were issued on the 1st for frosts in Wisconsin

and Illinois, and these were also verified. The ensuing three weeks were continuously above the seasonal normal. Freezing temperature was forecast on a few dates for the State of Wyoming and frosts in the lower Missouri and upper Mississippi Valleys on the 24th. It was not, however, until the 26th, 27th, and 28th that general frost warnings were issued for the sections from the Plains States eastward, and these warnings were verified practically without exception.

Special frost warnings were, moreover, issued to the cranberry marshes of Wisconsin up to the 5th, when they were discontinued, as the harvest at that time had been completed.

Fire-weather forecasts were sent to the national and State forests of Minnesota during two critical periods in the month of October. The fire hazard was terminated by the general rains which fell October 19 and 20.

Live-stock warnings were issued on October 30 for southern Wyoming and the western portions of Nebraska and Kansas, as a storm of considerable intensity was developing in the far southwest. This storm moved directly eastward and northeastward over the Chicago forecast district with general precipitation, considerable snow falling in the western portion of the area. As a consequence of the warnings, stock men had an opportunity of leading their cattle to shelter.—H. J. Cor.

Denver Forecast District.—Freezing temperature and local frost were general in the latter part of the month. The important freezes were well covered by the warnings distributed. On the 19th and 20th, however, warnings of freezing temperature for eastern Colorado failed of full verification, owing to the slow eastward progress of the storm over the southern Rocky Mountain region. The storm was retarded by a stationary area of high barometric pressure in the Southeastern States, and eventually decreased decidedly in energy.

A rather severe storm for the season appeared over Arizona near the close of the month. It is not clear whether this storm developed in the southern part of a trough of low barometer, or moved northeastward across the Gulf of California. It was central over northwestern Arizona on the morning of the 30th. Freezing temperature warnings were issued for eastern Colorado and on the morning of the 31st live-stock warnings were distributed in northeast Colorado, with the advice that heavy snow was indicated. Freezing temperature warnings were extended to southern Colorado on the evening of the 31st. Severe weather followed in eastern Colorado. The temperature fell to 25° at Denver and 18° at Cheyenne by the evening of the 31st, and temperatures ranged from 10° to 30° above zero on the morning of November 1.—Frederick W. Brist.

New Orleans Forecast District.—No storm warnings were issued. On the 22d a moderate gale attended a thunderstorm on the extreme east coast of Texas, but there was no general storm without warnings.

Small-craft warnings were issued for the Texas coast on the 13th and for the Louisiana coast and the east coast of Texas on the 24th, for conditions that were somewhat threatening for such craft.

After the first day of the month there were no extensive frosts until the closing week, when frost occurred in most interior sections on the 28th and 29th, for which generally sufficient warnings were issued. Forecasts of possible

frosts were issued for the extreme northwestern portion of the district on the 22d, 23d, and 26th, and for the northwestern portion on the 24th; but it was not certain that the weather would clear and in most cases these frost forecasts were not verified, though frost temperatures largely occurred. The forecast of the 14th for frost in the Texas Panhandle, contingent on clear weather, was verified. A forecast of freezing in the Texas Panhandle by the morning of November 1 was issued on October 30 and was verified.

Fire-weather warnings for forested regions in Oklahoma were issued on the 7th, and for Arkansas and Oklahoma on the 13th, and wind and weather occurred as forecast.—*R. A. Dyke.*

San Francisco Forecast District.—Killing frosts occurred in Nevada and eastern Oregon during the latter part of the first decade, and in northeastern Washington and Idaho during the second decade.

The following advisory and storm warnings were issued during the month:

1st, small-craft warnings were ordered at Washington coast and Sound stations 11 a. m., and changed to southwest storm warnings 6 p. m., at all Washington and Oregon stations.

3d, southwest storm warnings ordered 6:30 p. m., at the mouth of the Columbia River and Washington stations.

4th, southeast storm warnings ordered all Washington and Oregon stations 6:30 p. m.

5th, southeast storm warnings ordered Eureka to Mendocino 11:30 a. m., and at Point Reyes and San Francisco 4 p. m.

6th, all warnings ordered down 8 a. m.

10th, southwest storm warnings ordered 6 p. m., mouth of the Columbia River and Washington stations.

13th, southeast storm warnings ordered 11 a. m., all Washington and Oregon stations.

15th, southwest storm warnings ordered 6 p. m., Washington coast, and advisory warnings sent to other Washington and Oregon stations.

16th, southwest storm warnings ordered Puget Sound stations 7 a. m.

17th, southeast storm warnings ordered 8:30 a. m., all Washington and Oregon stations, and extended south to Eureka 6 p. m.

20th, advisory warnings issued 8 a. m., all Washington and Oregon stations.

24th, advisory warnings issued 8:30 a. m., all Washington and Oregon stations.

30th, advisory warnings issued 8:15 a. m., Port San Luis to San Diego, and small craft warnings ordered Straits of Fuca 11:30 a. m.—*G. H. Willson.*

RIVERS AND FLOODS.

FLOODS DURING OCTOBER.

By H. C. FRANKENFIELD, Meteorologist.

Heavy rains over northern New England caused a severe flood on October 4 in the Winooski River and other streams of northern Vermont, and considerable damage was done. The flood was said to have been the greatest since that of October 4, 1869.

A moderate flood, but without flood stages being reached, occurred over the lower Connecticut River early in the month on account of heavy rains over the valley, and advisory warnings were issued on the morning of October 1, a crest of 12.5 feet being forecast for Hartford, Conn., by October 2. A stage of 13.1 feet (flood stage, 16 feet) occurred at 9 p. m., October 2, the excess over the forecast stage having been caused by the giving way of a portion of the flash boarding on the Holyoke Dam, 32 miles above.

The Santee River was in moderate flood at the close of September and additional heavy rains on September 30 drove the river to a stage slightly in excess of the flood stage, Rimini and Ferguson, S. C., reporting stages of 12.9 and 12.4 feet, respectively (flood stage, 12 feet).

There were no losses, as the previous high water kept live stock from the swamps. There were no other floods east of the Mississippi River.

There were heavy rains over the Southwest during the early part of the third decade of the month, with resulting floods in some of the rivers of Oklahoma and Texas. There was a local flood in the Sulphur River of northwest Texas, with a crest stage of 22.6 feet, 2 feet above the flood stage, at Ringo Crossing. The river was above the flood stage for six days.

The North Fork of the Canadian River was in flood during the last week of the month, and the lower river remained so until November 8. Crest stages occurred as indicated in the second table following.

Warnings of the flood were first issued on October 22, and as often thereafter as occasion required, and, so far as is known, they were issued in ample time for farmers to protect themselves against loss. The greatest damage

was done in Oklahoma City, where the breaking of the levees resulted in the flooding of the low industrial and residential districts. No lives were lost.

The upper Trinity River of Texas was also in flood about the same time, although it subsided before the close of the month. Warnings were issued on October 24 and 25, one day in advance of the flood, and proved to be timely and accurate. Crest stages are given below. Losses were negligible, as the warnings enabled the removal of all stock from the overflowed lands before the arrival of the floods.

The Colorado River of Arizona was generally above the flood stage of 7 feet during the first three weeks of the month, with a maximum stage of 9.1 feet on October 3.

Estimated losses by floods.

River and district.	Farms, buildings, machinery, live stock, etc.	Suspension of business.	Value of warning.	Tangible property, roads, bridges, etc.	Crops matured.	Crops prospective.
North Canadian, Oklahoma, Okla.....	(1)	(1)	(1)	\$250,000
Trinity, Dallas, Tex....	(2)	None.	(1)	(2)	(2)	None.

¹ Impossible to estimate.

² Negligible.

Flood stages during month of October, 1920.

River and station.	Flood stage	Above flood stages—dates.		Crest.	
		From—	To—	Stage.	Date.
Atlantic Drainage:					
Susquehanna. Oneonta, N. Y.....	12	1	2	14.3	1
Santee: Rimini, S. C.....	12	1	5	12.9	3
Ferguson, S. C.....	12	2	9	12.4	5
Mississippi Drainage:					
North Canadian: Woodward, Okla.....	3	22	27	7.8	22
Canton, Okla.....	3	23	25	7.3	24
Oklahoma, Okla.....	12	20	(1)	13.3	30
Sulphur: Ringo Crossing, Tex.....	20	24	29	22.6	26
West Gulf Drainage:					
Trinity: Dallas, Tex.....	25	25	29	31.1	26
Colorado: Parker, Ariz.....	7	1	19	9.1	3

¹ Continued into November.